

**THE UNITED STATES DISTRICT COURT FOR THE  
EASTERN DISTRICT OF VIRGINIA  
Alexandria Division**

<b>COLGAN AIR, INC.,</b>	)	
<b>Plaintiff,</b>	)	
	)	
<b>v.</b>	)	<b>Civil Action No. 1:05cv213</b>
	)	
<b>RAYTHEON AIRCRAFT COMPANY,</b>	)	
<b>Defendant.</b>	)	

**ORDER**

The matter is before the Court on defendant's motion for permission to use an aircraft mock-up as a demonstrative aid in the course of the jury trial (docket no. 181).<sup>1</sup> As the motion has been fully briefed and argued, it is now ripe for disposition.

**I.**

A brief summary of the facts of the case is necessary to put defendant's motion in context. Specifically, this negligence and breach of warranty action arises out of the August 26, 2003 crash of a Beech 1900D aircraft, FAA Registration No. N240CJ ("Aircraft N240CJ"), off the Massachusetts coast. The suit is brought by Colgan Air, Inc. ("Colgan"), the air carrier that leased the aircraft, against Raytheon Aircraft Company ("Raytheon"), the manufacturer of the aircraft and the issuer of the aircraft's maintenance manual.

Prior to the crash, on August 25 and 26, 2003, Colgan's maintenance employees replaced Aircraft N240CJ's forward elevator trim tab cable after the existing cable had come off of the drum

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<sup>1</sup> Although summary judgment was originally entered in defendant's favor in December 2005, the Court of Appeals for the Fourth Circuit subsequently vacated summary judgment in part and remanded the matter for a jury trial in October 2007. *See Colgan Air, Inc. v. Raytheon Aircraft Co.*, 404 F. Supp. 2d 893 (E.D. Va. 2005), *vacated in part and remanded*, 507 F.3d 270 (4<sup>th</sup> Cir. 2007).

and kinked as a result of earlier maintenance performed on the aircraft. In this regard, while the parties dispute the legal proximate cause of the crash, it is undisputed that Colgan's maintenance personnel, using the aircraft's allegedly defective maintenance manual, incorrectly installed the trim tab cable such that the trim tabs operated in reverse. As a result, when the cockpit controls were used to set the trim tabs to a nose-up position, the trim tabs actually moved to a nose-down position, and vice versa. This dangerous condition was not discovered by Colgan's maintenance crew during their post-maintenance operational checks, nor was it discovered by Colgan's pilots in their pre-flight checks. Thus, when the pilots attempted take-off on August 26, 2003, the reversal of the trim tabs caused the aircraft to crash, killing both of the pilots and destroying the aircraft.

Colgan assigns the blame for the accident to an allegedly defective aircraft maintenance manual provided by Raytheon. The manual at issue — Revision 9 of the Raytheon Electronic Publications Program Maintenance Library for the Beech 1900 Aircraft ("REPS Manual") — was provided by Raytheon in electronic format and received by Colgan on or about May 23, 2003.<sup>2</sup> The REPS Manual contained a section within Chapter 27 entitled "Flight Controls-Description and Operation" which included the following language:

Proper winding of the cables on the pedestal and actuator drums, is shown in . . . the Elevator Tab Control Cable Winding illustration in Chapter 27-30-04 for elevator tabs, [and] ensures against crossing the cables and causing improper trim tab movement.

(Emphasis in original). Clicking on the underlined portion of the language above led to Figure 201

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<sup>2</sup> Raytheon issued both paper maintenance manuals and maintenance manuals in electronic format, and Colgan used both types of manuals in connection with maintaining their fleet of approximately seventeen 1900 Series aircraft. The substantive content of the electronic and paper manuals was identical. With respect to the maintenance performed on the trim tab cables at issue here, Colgan contends that the REPS Manual was used exclusively by its maintenance employees.

of Chapter 27-30-04, which depicted the forward trim cable drum backwards, or 180 degrees from the installed position, and showed the open, keyed side of the drum, rather than the flat side. Colgan claims that its maintenance crew followed the REPS Manual's directions as depicted in Figure 201, resulting in the reversal of the action of the elevator trim system.

Colgan also claims that the table of contents for Chapter 27 of the REPS Manual failed to contain a reference or hyperlink to an operational check that would have revealed the problem with the trim tabs.<sup>3</sup> Because Colgan's maintenance personnel did not locate or find the appropriate operational check, which was included in both the paper and REPS versions of the manual, they proceeded to devise their own check. Yet, their check was not sufficient to disclose the problem with Aircraft N240CJ's elevator trim system. Colgan contends that these two alleged defects with the REPS Manual — the incorrect drum drawing and the missing hyperlink — proximately caused the crash of the aircraft on August 26, 2003.

Raytheon disputes that these alleged defects in the manual caused the crash and argues that the blame for the reversed trim tab controls rests squarely on the shoulders of Colgan's maintenance and flight crews. Specifically, Raytheon claims the error in Figure 201 should have been immediately apparent to Colgan's maintenance crew as the drum depicted in Figure 201 is patently backwards from the actual drum, which shows the flat side, and cannot be reversed in the aircraft itself. In addition, Raytheon contends that Colgan's maintenance crew committed independent error in crossing the cables through the rear of the aircraft, without which the error in the manual would

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<sup>3</sup> A hyperlink is a reference in a hypertext file such as the REPS Manual to another location in the file. Hyperlinks are typically activated by clicking on the highlighted text, which will cause the display of the target link. Revision 10 of the REPS Manual, which Colgan had not yet received at the time of the crash, did contain a hyperlink to the operational check.

have been obvious. The manual does not depict crossed cables. Further, Raytheon argues that the failure of Colgan's mechanics to perform an adequate operational check cannot reasonably be ascribed to the missing hyperlink, since Colgan's mechanics knew that they needed to perform the operational check, and indeed had done so in the past. Raytheon also argues that the missing hyperlink is causally irrelevant because the section of the manual describing the correct operational check could have been located in the REPS Manual without the hyperlink. The absence of a hyperlink, in Raytheon's view, is merely the absence of a convenience; it is not an excuse to use the manual imprudently. Finally, Raytheon argues that the pilots of the subject aircraft were also negligent in failing to discover the reversed trim tabs in their pre-flight check. Specifically, Raytheon contends that the pilots, on their maintenance pre-flight check, were required to check the full range of elevator nose-up and nose-down trim. Had they done so, Raytheon contends, they would have discovered they could only obtain 6 degrees of nose-up trim instead of the normal 17 degrees of nose-up trim, and 17 degrees of nose-down trim instead of the normal 6 degrees of nose-down trim. This, Raytheon contends, would have alerted the pilots to the reversal of the trim tab cable connections.

At issue now is Raytheon's request for permission to use a mock-up of a portion of the aircraft in the course of the jury trial to assist the jurors in understanding the issues and evidence in the case. The proposed mock-up separates into two sections. When assembled, it measures approximately 4 feet tall, 8 feet deep and 8 feet wide. The mock-up includes the Beech 1900D aircraft cockpit pedestal, trim wheel, cable drum, cables, turnbuckles, elevator and trim tabs essentially similar to those present on Aircraft N240CJ, the aircraft involved in the crash. To be sure, the mock-up does not replicate the actual sizes and relative positions of the elevator, the

elevator trim tabs and the cockpit trim wheel. Nor does the mock-up include the entire stabilizer and trim tab. Precisely replicating the relative positions, lengths and sizes of these components would, of course, result in a model far too large for courtroom use. But importantly, the cable routing through the pedestal in the mock-up is essentially the same as it is in the actual aircraft, although the length of the cables back to the turnbuckles has been substantially shortened to render the size of the mock-up manageable. Additionally, the trim included in the mock-up works electrically and manually just as it does in the actual aircraft.

In support of its motion, Raytheon contends that the mock-up will be used primarily by Raytheon's expert to aid him (i) in his description to the jury of the nature and function of the aircraft's stabilizer, elevator, elevator trim tabs and elevator trim tab controls and (ii) in his explanation of how the mechanics' and pilots' operational checks, if performed properly, would have disclosed the error in the cable installation. Use of the mock-up would allow the jury to observe how the rigging of the system during maintenance and post-maintenance operational and pre-flight checks reveal the direction and range of movement of the trim tabs. Significantly, Raytheon seeks only to use the mock-up as a demonstrative or illustrative aid; it does not seek to have the mock-up introduced as evidence or an exhibit in the course of the trial. Colgan nonetheless objects to any use of the mock-up at trial, arguing essentially that any probative value the expert's use of the mock-up may have is substantially outweighed by the danger of unfair prejudice to Colgan owing to the mock-up's size and its dissimilarities to the actual aircraft. *See* Rule 403, Fed. R. Evid.

## II.

Demonstrative aids are appropriately and widely used in trials to help illustrate for the jury matters that might otherwise be less than fully understood. Such aids can take various forms,

including, *inter alia*, diagrams, maps, computer animations or, as involved here, mock-ups. And regardless of the particular form, all demonstrative aids generally serve the same purpose, namely to explain or clarify a complex principle or concept or to aid in the understanding of complicated witness testimony, particularly expert testimony. In other words, the primary purpose of a demonstrative aid is “to illustrate other admitted evidence and thus to render it more comprehensible to the trier of fact.” 2 *McCormick on Evidence* § 214 (6<sup>th</sup> ed. 2006). Given this salutary purpose, it is not surprising that it is well-settled in this circuit and elsewhere that demonstrative aids can be used to help illustrate an expert witness’s testimony on technical aspects of a particular case.<sup>4</sup>

The analysis governing the use of demonstrative aids in trials involves several steps, beginning with Rule 611, Fed. R. Evid., which grants trial courts broad discretion in exercising control over the presentation of evidence in the course of a trial. Specifically, Rule 611(a) provides that

[t]he court shall exercise reasonable control over the mode and order of interrogating witnesses and presenting evidence so as to (1) make the interrogation and presentation effective for the ascertainment of truth, (2) avoid needless consumption of time, and (3) protect witnesses from harassment or undue embarrassment.

Rule 611(a), Fed. R. Evid.<sup>5</sup> It is clear that the reasonable and appropriate use of a demonstrative aid could very well contribute to accomplishing two of Rule 611’s goals. Specifically, and in this

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<sup>4</sup> See, e.g., *United States v. Beckford*, 211 F.3d 1266 (Table), 2000 WL 376155 (4<sup>th</sup> Cir. 2000) (approving the use of a computer-generated diagram as a demonstrative aid to help illustrate a detective’s testimony and investigative findings concerning his observations of bullets, bullet holes and bullet path angles); *United States v. Salerno*, 108 F.3d 730, 744 (7<sup>th</sup> Cir. 1997) (recognizing that “[d]emonstrative aids are regularly used to clarify or illustrate testimony”) (citations omitted).

<sup>5</sup> See, e.g., *United States v. Johnson*, 54 F.3d 1150 (4<sup>th</sup> Cir. 1995) (recognizing that the district court was within its discretion in allowing a summary chart and accompanying foundational testimony to be admitted into evidence under Rule 611(a), Fed. R. Evid.).

context, it is clear that use of the mock-up would assist the jurors in understanding the complicated and technical issues involved in this case and thereby aid in the “ascertainment of the truth;” use of the mock-up would also “avoid needless consumption of time” that might otherwise be required to ensure jury comprehension. Rule 611(a), Fed. R. Evid.

The next step in the analysis is to address the issue of relevance, as any proposed demonstrative aid must, of course, be used in connection with testimony that is relevant to the issues presented. *See* Rules 401, 402, Fed. R. Evid. Evidence is relevant if it has “any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.” Rule 401, Fed. R. Evid. In this regard, it is important to note that demonstrative aids often “do not have *independent* probative value for determining the substantive issues in the case.” 2 *McCormick on Evidence* § 214 (6<sup>th</sup> ed. 2006) (emphasis in original). Yet, they are nonetheless “relevant...because of the assistance they give to the trier in understanding other real, testimonial and documentary evidence.” *Id.* Indeed, models and mock-ups “are relevant under the theory that they illustrate and explain live testimony, and they are authenticated simply on the basis of testimony from a witness that they are substantially accurate representations of what that witness is trying to describe.” *Id.* Mock-ups such as the one offered by Raytheon are particularly helpful where, as here, the average juror is unfamiliar with the complicated technical information relevant to the issues presented. Indeed, it is only the very rare juror who is familiar with the operation and function of aircraft elevator trim tabs and trim tab controls. Thus, use of the proposed aircraft mock-up, combined with explanatory expert testimony, will assist the jurors in gaining a better understanding of such technical information and will likewise assist the jurors in assessing critical trial issues of causation.

Given the clear relevance of the aircraft mock-up to the issues presented, the next step in the demonstrative aid analysis is to weigh the probative value of the proposed use of the demonstrative aid against the risk of unfair prejudice to the opposing party through use of the demonstrative aid. This important step in the analysis is required and governed by Rule 403, Fed. R. Evid., which provides that

[a]lthough relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.

Rule 403, Fed. R. Evid. By its terms, Rule 403 requires district courts to engage in a balancing of probative value and the risk of unfair prejudice. Thus, although demonstrative aids such as models and mock-ups may indeed present some risk of prejudice owing to “inaccuracies, variations of scale, [and] distortion of perspective,” this potential for prejudice is appropriately addressed through application of a Rule 403 balancing test. 2 *McCormick on Evidence* § 214 (6<sup>th</sup> ed. 2006). In this respect, the relevant question is not whether use of the demonstrative aid would involve some risk of prejudice in general, but rather whether it would involve unfair prejudice, which the Fourth Circuit has defined as “a genuine risk that the emotions will be excited to irrational behavior, and that this risk is disproportionate to the probative value of the offered evidence.” *United States v. Odeozor*, \_\_\_\_ F.3d \_\_\_\_, 2008 WL 271295, \*2 (4<sup>th</sup> Cir. Feb. 1, 2008) (quoting *United States v. Ham*, 998 F.2d 1247, 1252 (4<sup>th</sup> Cir. 1993)). Thus, the “probative value [of a particular demonstrative aid] is measured by the degree to which the judge thinks that the item will assist the trier of fact in understanding the witness’s testimony.” 2 *McCormick on Evidence* § 214 (6<sup>th</sup> ed. 2006). In this regard, when a district judge exercises his or her discretion to allow the use of a particular



demonstrative aid, it will only rarely be found in error, and “[t]his is particularly true if the potentially misleading features [of the demonstrative aid] have been pointed out by witnesses for the proponent, or could have been exposed upon cross-examination.” *Id.*

These principles, applied here, point persuasively to the conclusion that it is appropriate to allow Raytheon to use the proposed aircraft mock-up in the course of the jury trial.<sup>6</sup> And, while there are indeed differences or variations in scale between the mock-up and the actual aircraft, these differences can adequately be addressed by Colgan in the course of cross-examination. Specifically, Raytheon will be permitted to ask its expert witness questions concerning the mock-up in the jury’s presence, with Colgan having an adequate opportunity for cross-examination. The reason for allowing the mock-up to be used in this manner is clear, as the highly technical aspects of the trim tabs and electronic controls of an aircraft are foreign to the average juror. Significantly, use of the mock-up will not give rise to any unfair prejudice to Colgan; nor will use of the mock-up present “a genuine risk that the [jurors’] emotions will be excited to irrational behavior.” *Odeozor*, \_\_\_\_ F.3d \_\_\_\_, 2008 WL 271295, \*2. Rather, use of the mock-up will be helpful to the jury in understanding the nature and function of the unfamiliar and relevant aircraft parts and controls that will be addressed in the course of the trial. In short, the mock-up, combined with corresponding relevant expert testimony, will assist the jurors in assessing the issues of causation presented in this case.

### III.

In sum, then, the proposed mock-up is clearly relevant to the issues presented and its probative value is not “substantially outweighed by the danger of unfair prejudice, confusion of the

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<sup>6</sup> Because the proposed mock-up will not conveniently fit in the well of the courtroom, the jury will be required to view the mock-up and the corresponding expert testimony from the courthouse loading dock.

issues, or misleading the jury....” Rule 403, Fed. R. Evid.<sup>7</sup> Rather, use of the mock-up will assist the jurors in understanding the technical aspects of this case and in evaluating the critical issues of causation. It is therefore appropriate to allow Raytheon to use the proposed aircraft mock-up in the course of the jury trial in the manner and to the extent described above.

Accordingly, for these reasons, and for good cause,

It is hereby **ORDERED** that defendant’s motion for permission to use an aircraft mock-up as a demonstrative aid in the course of the jury trial (docket no. 181) is **GRANTED**.

The Clerk is directed to send a copy of this Order to all counsel of record.

/s/

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T. S. Ellis, III  
United States District Judge

Alexandria, VA  
February 21, 2008

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<sup>7</sup> See, e.g., *Roland v. Langlois*, 945 F.2d 956 (7<sup>th</sup> Cir. 1991) (where, in an action by a carnival patron who was injured when struck by an amusement ride, a life-size model offered by defendant was admissible as the benefits from use of the model were not substantially outweighed by the danger of unfair prejudice).